ACE #122-Revised

UNITED STATES DEPARTMENT OF AGRICULTURE
Bureau of Agricultural Chemistry and Engineering

January 1942 Stoneville, Miss.

COTTON GIN FIRES AND PREVENTION 1/

By
Chas. A. Bennett
Senior Mechanical Engineer

Cotton gin fires, like house fires, occur from many causes, and most destructive gin fires break out at night. About one-third of all the gin fires reported during the time of gin operation are small and the losses are negligible. They may arise from external as well as internal, or operating, causes. According to underwriters' reports in Mississippi, incendiarism accounts for approximately 8.9% of the gin fires reported from 1935 to 1940. 2/

Modern, all-steel, single-story gin buildings having machinery with sealed ball or roller bearings and direct drives have greatly decreased the number of gin fires. These buildings have concrete or steel floors, better illumination, greater clearances between building walls and machinery, adequate water systems, and are provided with chemical and other fire-fighting apparatus.

A discussion of gin fires in the light of modernized apparatus and better ginning facilities is the purpose of this article.

External Causes of Fires at Gins

Occasionally smoldering cotton is delivered to the gin and drawn into the machinery or placed in storage in that condition. Such smoldering fires in loads of seed cotton probably are caused by careless disposal of matches or cigarettes by smokers.

Sparks from gin or railroad engines or from unscreened boiler stacks ignite cotton bales in open storage at the gin site, thereby accounting for many fires. Intruders cause some fires. Burning dry grass and weeds near or on the premises is a cause of fire in bales stored in the open. Defective wiring in contact with wooden structures contributes to fire hazards.

Cotton storage houses unload seed cotton from vehicles in several ways, some of which produce fires through friction when matches or pieces

---

1/ Acknowledgment is made to Messrs. Francis L. Gerdes and Ralph A. Rusca of the Agricultural Marketing Service for their suggestions and assistance in the fire tests at the U. S. Cotton Ginning Laboratory.

2/ Mississippi State Rating Bureau. F. Julian Carroll, Jr., "Cotton Ginning in Mississippi From an Underwriter's Standpoint", 1940.

of metal or rocks are present in the seed cotton. The pneumatic methods of placing seed cotton in storage bins require fans and piping. The older methods, using droppers, have screens and galvanized piping which produce friction on match heads, and under certain conditions sparks are caused by impact with rocks or metals. The newer methods, using Rembert-type fan unloaders, employ galvanized piping and bin valves, but pass the seed cotton directly through the fan casing into discharge ducts without striking the fan blades which are separated from the cotton flow by perforated guards or disks. Head-on impact of matches, rocks or metals on these high speed perforated guards or disks is probably the only cause of fires in such systems, which handle thousands of bales of cotton annually with relatively few fires. Frequency of fires in Rembert-type unloading fans has decreased with the adoption of smoothly perforated plate disks in place of the older forms of coarse screened guards. Rubber lining of the scrolls of these fans should somewhat reduce the fire hazard.

Internal and Operating Causes of Gin Fires

The presence of matches in the incoming seed cotton, as mentioned before, is a frequent source of fire hazard, not only because they are seldom of the "safety type", but also because modern all-steel cotton gins employ higher speeds and velocities in piping and moving parts. Hence, common matches can be ignited by impact in unloading fans, separators, cleaners, feeders and gin breasts, as well as by friction encountered in high velocity piping, distributors and cleaners.

Overhead cleaners, having cylinders or beaters of many types, have been a frequent source of fires, even in all-steel construction with ample clearances and ball bearings. Tests at the U. S. Cotton Ginning Laboratory have shown that when the matches are dry, about ten per cent of all the matches (except safety matches) will ignite in either the Rembert-type fan or the first cleaner they come to and almost invariably fire the cotton. Many matches were observed to ignite in the blow-box when used with a Rembert-type fan.

In many gins, separators are ahead of overhead cleaners in the cotton flow line, hence fires might begin in the separators, caused by matches or hard foreign material striking the screens and beaters. Fifty per cent of the matches passed through the test separator were ignited.

Old-style belt distributors are a double source of fires -- from friction with matches, and from lack of alignment which produces friction in the conveying boxes and at the pulleys. Settling of wooden buildings, to which belt distributors are generally attached, causes serpentine misalignment with attendant fire-producing friction. Cotton can burn for a considerable time while passing through the distributor and the distributor hoppers. The extent of the damage depends upon how soon the fire is discovered and how quickly the supply of cotton from the wagon is shut off.

Gin stand feeders, like overhead cleaners, may in some instances start fires, but the modern, all-steel extractor-feeders with kicker

wheels, which prevent airflow through the machines, snuff out many fires which reach them.

Saws and ribs of cotton gin stands are a common source of gin fires through friction between saws and cotton chokages. Chokages may occur in the huller breasts, or by cotton fiber wedging into the rib slots from the back side of the assembly.

Old-style gin stands with flat bearings and poor thrust provisions permit side swipe between saws and ribs, but new all-steel gin stands with self-aligning ball bearings prevent metal-to-metal contacts of this nature. Faulty doffing of ginned fiber from the saws, due to backlash or ineffective removal of fiber from the saws will build up a quantity of lint against the bottom of the ginning ribs on the back side. Friction with the saws quickly results and starts fires. Faulty huller-front action may also permit chokages in the upper part of the ribs and produce fire hazard.

All-metal, insulated cotton driers, when run at recommended low temperatures, are not deemed by the underwriters to be fire hazards, especially when steam radiators supply the heat.

Lint flues and presses are not known to produce gin fires, although they sometimes convey or retain smoldering fires which may later spread. Matches, and other foreign materials of fire-producing type, cannot pass through the gin seed rolls into the press by way of the lint flues, and the old steam jets or lint-flue extinguishers seldom do anything except make matters worse in a gin fire. Bales may burn internally for several hours before bursting into flame, and there should be ample time to segregate them when fire is suspected.

Keeping the gin building clean reduces the fire hazard. Explosive dusts are generated in dirty surroundings much more frequently than realized, and this condition, in combination with faulty wiring, sparking motors, heat and sparks resulting from friction, dripping lubricants and inadequate ventilation, probably produces some of the fires reported as from "unknown causes".

Fire insurance companies have estimated that in electrically-operated gins neglected motors are the prime cause of one fire out of every fourteen and that 30% of all fires of electric origin are found to start in the motors. Oil-soaked, neglected motors are often subjected to peak loads and as a result "shorts" may form in the oily windings, worn bearings may fail to maintain proper air gaps, and dry bearings seize. Oil gradually rots the insulation, and dust coatings further endanger the motors.

To summarize, there appear to be at least 15 reasonable steps that may be taken to reduce the fire hazard in gins:

1. Forbid smoking on the premises and insist upon the use of safety matches by employees and patrons. If ordinary friction matches are brought on the premises, exchange safety matches for them.

2. Inspect the pockets of all patrons associated with gin fires for the type of matches carried.

3. Keep distributors in alignment, and line unloading fan scrolls with leather, rubber or belting.

4. Remove causes of backlash or chokages in gin stands.

5. Clean the premises inside and out, frequently and regularly. Clean condensers daily. Keep premises ventilated and free from festoons of "fly" or lint.

6. Keep all gin saws and ribs in good condition. Sharpen the saws lightly and often, rather than heavily and infrequently.

7. Inspect the plant each day before closing for indications of smoldering fires.

8. Use sealed ball or roller bearings in place of flat or ring-oiling bearings and do not allow accumulations of oil and grease. Wipe motors clean, free from excess oil, grease and dust, and maintain the bearings in first-class condition.

9. Do not store baled cotton near the gin, nor where sparks can reach it.

10. Maintain an adequate supply of fire extinguishers and well-filled water barrels in convenient places. To reduce theft and misplacement, use buckets with cone-shaped bottoms.

11. Run out all cotton on the floor in case of fire, and DO NOT STIR BURNING SEED COTTON.

12. Provide each piece of gin apparatus with suitable electric grounding to prevent the accumulation of static electricity.

13. Convey all trash at least 25 feet away from nearest building.

14. Permit no flame lanterns or other flame lights on the premises.

15. Put screens on all smoke stacks and on intakes to fans.